Claims:

We claim:

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1. A method of sizing cracks in a metal surface using sound wave measurements of propagation and reflection thereof which are initiated at an optimal degree angle to the surface comprising the steps of:

review sound wave data for signal reflections at l/2 skip, full skip and 1 l/2 skip locations;

when l/2 skip, full skip and 1 l/2 skip reflections are detected reviewing reflected signals for a crack tip signal;

whenever crack tip signal is verified using crack tip signal to size the surface crack.

2. A method as set forth in claim 1 including the further steps of:

reviewing reflected signal data to determine if no crack tip signal was detected and that reflections are present at the l/2 and l l/2 skip locations;

using target motion TOF with MCS correction to size the surface crack.

3. A method as set forth in claim 2 including the further steps of:

reviewing signal reflected data to determine if full skip signal was present in addition to the l/2 skip and l l/2 skip signals;

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using FSN sizing method to size the surface crack whenever the above signals are present.

4. An FSN method where the ratio of the full skip amplitude to the average of the outer diameter skip amplitudes produces a normalized result. This ratio can be used to depth size deep cracks propagating from the surface opposite from the UT transducer.

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5. A method as set forth in claim 4 where the FSN ratio is converted to the remaining wall thickness with a convenient formula.

6. A method as set forth in claim 5 where for the given application of the thin wall tubing with thickness between 0.035 to 0.070 inches, the remaining wall thickness is obtained by the following formula:

Remaining Wall (inches) = 0.031 – FSN ratio * 0.031

7. A method as set forth in claim 3 wherein the sound waves are UT waves initiated at an appropriate angle to the metal surface.

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8. A method as set forth in claim 7 wherein the metal surface is a composite or otherwise intimately bonded layer of metal tube or plate having a crack width less than 0.001 in.

9. A mode conversion method (MCS) as set forth in claim 2 where the **UNCORRECTED UT DEPTH ESTIMATE** is the UT system depth measurement based on the conventional shear wave target motion time of flight (TOF) analysis.

10. A mode conversion method (MCS) as set forth in claim 2 where the **UNCORRECTED TOF DEPTH PREDICTION** is derived from a theoretical model of a mode converted signal. The model calculates the resultant of depth based on the known notch depth and shear wave target motion TOF technique.

11. A mode conversion method (MCS) as set forth in claim 2 where the **CORRECTED TOF DEPTH PREDICTION** is the **UNCORRECTED UT DEPTH ESTIMATE** value multiplied by a MCS correction factor.

12. A method as set forth in claim 2 wherein the metal surface is a thin wall tube and the MCS correction factor is determined experimentally and is between 1.6 and 1.9.